ESS Batteries by Samsung SDI
Top Safety & Reliability Solutions

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Samsung SDI is leading the change of a new era with lithium-ion batteries.

Through our constant innovation towards excellence, we led with the technological superiority of our innovative IT devices and expanded into electric cars which have now become reality. In addition, we are contributing to the expansion of an eco-friendly environment by the deployment of batteries for energy storage.

We are all dreaming of a better future with BoT (Battery of Things) in which Samsung SDI will provide solutions for the world.

Powering Tomorrow,
Samsung SDI Battery Solution For Energy Storage

Samsung SDI’s technology supplies eco-friendly energy solutions for the present and the future. We provide safe, reliable and long-lasting performance with our Energy Storage solutions. ESS projects are deployed using Samsung SDI’s battery solutions optimized for a range from residential to utility-scale projects.

Utility & Commercial

Optimized Battery Platforms Based on High-Density Design Technology

- Solar & Wind Farm
- Grid (Substation)
- Building, Factory

UPS

Lithium-ion Solution

Proven High-Voltage LIB Solutions Compatible with Premium UPS

- Data Center
- Factory

Residential & Telecom

Scalable Standard Battery Pack for Customized ESS

- PV Home
- Telecom
Why Samsung SDI

Samsung SDI optimizes battery systems with advanced cell technology.

Safety First

Multi-Layered Protection

Safety first is Samsung SDI priority. Prismatic cell has multi-layered protection at the cell level resulting in best in class safety. In addition, the aluminum exterior has excellent thermal conductivity and cooling performance, and it releases high temperature safely and efficiently from the inside to the outside.

Long Cycle Life

Industry Leading Cycle Life Performance

6,000 Cycles

@ continuous 1C /1C, SOH 80%

Samsung SDI ESS leverages our manufacturing experience in IT and automotive battery cells resulting in superior and adaptive technology. Samsung SDI ESS is recognized as the industry leader in the market, providing our customers with the safest and long lasting batteries.

Sustainable Design

Easy to Upgrade

Capacity without Design Change

We are continuously innovating to increase the energy density while maintaining the same form factor and cell dimensions, thus facilitating future upgrades to higher capacity, higher energy density, ESS with no change to pack design.

Accurate Lifetime Simulation

Samsung SDI offers optimal battery solution with its superior lifetime prediction technology. We design and propose a battery system with analyzing the various parameter such as purpose, operation period and installation environment.
Energy density has increased more than 18% with upgrades to Samsung SDI’s new advanced cell

Higher density enables better footprint and installation cost savings

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**Standard Platform**

**Energy Platform**

**Over 2 hours**

- Energy density has increased more than 18% with upgrades to Samsung SDI’s new advanced cell
- Higher density enables better footprint and installation cost savings

**Medium Platform**

**1+hour up to 45 minutes**

- Unique Platform in the ESS Industry with Mid-range Capabilities
- Optimized Solution for around One hour of Grid Service
- The Highest Lifetime Performance in a Continuous Charge/Discharge for 1 hour

**Power Platform**

**30 minutes up to 20 minutes**

- High Power Platform Optimized for Less than 30 minutes of Use
- Optimized Solution for Power Applications such as F/R, Railway, Ship, etc.

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**Item** | **Module** | **Rack**
--- | --- | ---
**Model** | E3-M090 | E3-R081 | E3-R099 | E3-R108
**Cell Capacity Ah** | 111 | 111 | 111 | 111
**Energy kWh** | 90 | 81 | 88 | 108
**Operating Voltage V** | 70.4–91.3 | 634–822 | 774–1,004 | 845–1,096
**Dimension (W x D x H) mm** | 370 x 588 x 160 | 442 x 702 x 1,792 | 442 x 702 x 2,124 | 442 x 702 x 2,290
**Weight kg** | 55 | 550 | 670 | 730

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**Item** | **Module** | **Rack**
--- | --- | ---
**Model** | M2-M076 | M2-R068 | M2-R084 | M2-R091
**Cell Capacity Ah** | 94 | 94 | 94 | 94
**Energy kWh** | 7.6 | 68 | 84 | 91
**Operating Voltage V** | 70.4–91.3 | 634–822 | 774–1,004 | 845–1,096
**Dimension (W x D x H) mm** | 370 x 650 x 160 | 442 x 702 x 1,792 | 442 x 702 x 2,124 | 442 x 702 x 2,290
**Weight kg** | 55 | 550 | 670 | 730

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**Item** | **Module** | **Rack**
--- | --- | ---
**Model** | P3-M063 | P3-R057 | P3-R070 | P3-R076
**Cell Capacity Ah** | 78 | 78 | 78 | 78
**Energy kWh** | 63 | 57 | 70 | 76
**Operating Voltage V** | 68.2–90.2 | 614–812 | 750–992 | 818–1,082
**Dimension (W x D x H) mm** | 370 x 650 x 160 | 442 x 702 x 1,792 | 442 x 702 x 2,124 | 442 x 702 x 2,290
**Weight kg** | 55 | 550 | 670 | 730
Battery Platform for Utility & Commercial ESS

Special Platform

1,500 High Voltage Platform

- High Efficiency Battery Solution for 1,500V PCS

Minimize Power Loss by Enabling High Power Output
Minimize Total Footprint by Reducing Footprint of PCS and Battery System
Maximize Economics & Efficiency

<table>
<thead>
<tr>
<th>Item</th>
<th>Platform</th>
<th>Energy kWh</th>
<th>Medium</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>E2-R122</td>
<td>94</td>
<td>94</td>
<td>78</td>
</tr>
<tr>
<td>Cell Capacity</td>
<td>Ah</td>
<td>122</td>
<td>122</td>
<td>102</td>
</tr>
<tr>
<td>Operating Voltage</td>
<td>V</td>
<td>1,126–1,461</td>
<td>1,126–1,461</td>
<td>1,091–1,447</td>
</tr>
<tr>
<td>Dimension (W x D x H) mm</td>
<td>442 x 702 x 2,297</td>
<td>442 x 702 x 2,297</td>
<td>442 x 702 x 2,297</td>
<td></td>
</tr>
<tr>
<td>Weight kg</td>
<td>980</td>
<td>980</td>
<td>980</td>
<td>980</td>
</tr>
</tbody>
</table>

40FT ISO Container Platform

- Optimized Solution for 40FT ISO Standard Container

The Highest Capacity at 40FT Container

22S Module Design for Maximizing Rack's Energy Density
30S Module Design for Minimizing Container's Footprint

External Door

<table>
<thead>
<tr>
<th>Item</th>
<th>Module</th>
<th>Rack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>E3-M123</td>
<td>E3-R135</td>
</tr>
<tr>
<td>Cell Capacity</td>
<td>Ah</td>
<td>111</td>
</tr>
<tr>
<td>Energy</td>
<td>kWh</td>
<td>10.5</td>
</tr>
<tr>
<td>Operating Voltage</td>
<td>V</td>
<td>96–126</td>
</tr>
<tr>
<td>Dimension (W x D x H) mm</td>
<td>344 x 160 x 1,012</td>
<td>415 x 1,067 x 2,124</td>
</tr>
<tr>
<td>Weight kg</td>
<td>90</td>
<td>1,170</td>
</tr>
</tbody>
</table>
Batteries for

UPS Uninterruptible Power Supply

Proven High-Voltage LIB Solutions
Compatible with Premium UPS

Benefits of Lithium-ion Batteries

Why Samsung SDI

• Only Samsung SDI can provide a 10 minute backup battery solution
• Compatible with Global UPS Battery Solutions
• Proven Safety & Quality
• Global Reference to IDC, a Factory in Operation for over 5 years

Product Lineup

<table>
<thead>
<tr>
<th>Item</th>
<th>Module</th>
<th>Rack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>U6-M020</td>
<td>U6-M035</td>
</tr>
<tr>
<td>Cell Capacity</td>
<td>Ah</td>
<td>67</td>
</tr>
<tr>
<td>Energy</td>
<td>kWh</td>
<td>2.0</td>
</tr>
<tr>
<td>Operation Voltage</td>
<td>V</td>
<td>24~33.6</td>
</tr>
<tr>
<td>Dimension (W x D x H)</td>
<td>mm</td>
<td>216 x 414 x 163</td>
</tr>
<tr>
<td>Weight</td>
<td>kg</td>
<td>17</td>
</tr>
</tbody>
</table>

*This comparison above is based on each material’s characteristic. The Battery life time may vary depending on the environmental condition which the device are used in and the customer’s usage pattern.
**Residential & Telecom**

Scalable Standard Battery Pack for Customized ESS

- **PV Storage / Off-Grid Backup**
  - **PV Storage**
  - **Off-Grid Backup**

- **48V Solution**
  - High Energy 94Ah Prismatic Cell
  - High Energy Density & Long Cycle Life
  - Available up to 1C-rate
  - Fits on 19 inch Standard Rack
  - Wide Temperature Range

- **HVS Solution**
  - Advanced 21700 Cylindrical Cell
  - High Conversion Efficiency (DC to AC)
  - Optimized for High Voltage PCS
  - Superior Performance at High Temperature

### Scalable Capacity

<table>
<thead>
<tr>
<th>Item</th>
<th>R1-M04B</th>
<th>R3-M020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component</td>
<td>Battery Module, BMS</td>
<td>Battery Module, BMS</td>
</tr>
<tr>
<td>Nominal Energy kWh</td>
<td>4.8</td>
<td>12.0</td>
</tr>
<tr>
<td>Operating Voltage V</td>
<td>44.8–58.1</td>
<td>84.0–112.6</td>
</tr>
<tr>
<td>Dimension (W x D x H) mm</td>
<td>446 x 440 x 158</td>
<td>433 x 722 x 191</td>
</tr>
<tr>
<td>Weight kg</td>
<td>15</td>
<td>38</td>
</tr>
<tr>
<td>Operating Temperature °C</td>
<td>-10–50</td>
<td>0–60</td>
</tr>
</tbody>
</table>

### Scalable Voltage & Capacity

- **100V**
  - 2.0kWh
- **200V**
  - X Max.6
- **600V**
  - 12.0kWh

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**Easy Installation**

- Easy Installation by Simple Module Structure

**Scalability**

- Easy to Expand Capacity

**Compatibility**

- Compatible with Various Standard Inverters

* Inverter for Residential, SMPS for Telecom
Global Track Record

Since 2010, Samsung SDI’s ESS products have been successfully operating in over 30 countries.

Today, Samsung SDI continues to make history by leading the growing global ESS market, based on best in class battery technology and strong partnerships.

America

USA
- California: 150MWh Deployed 2017~
- Austin, TX: 30MW / 144MWh
- El Cajon/Escondido, CA: 57.5MWh / 152MWh
- Pomona, CA: 20MW / 80MWh
- Indianapolis, IN: 20MW / 103MWh
- El Centro, CA: 30MW / 204MWh
- Tucson, AZ: 10MW / 54MWh
- Clinton, OH: 10MW / 4MWh

Canada
- Sault Sainte Marie, Ontario: 8MW / 8MWh

Europe

Germany
- Schwerin: 10MW / 10MWh Deployed 2014~
- Schwerin: 10MW / 10MWh
- Aachen: 5MW / 3MWh
- Chemnitz: 10MW / 16MWh

UK
- Leighton Buzzard: 8MW / 11MWh

Netherlands
- Zeeland: 10MW / 104MWh
- Caribbean Islands: 2MW / 1MWh

Asia & Oceania

Korea
- KEPCO/F: 38MWh Deployed 2015~
- KEPCO/F (5 Sites): 122MW / 384MWh
- KDNOC (3 Sites): 22MW / 63MWh
- PyeongChang: 6MW / 18MWh
- Ulsan: 24MW / 53MWh

China
- Tibet: 2MW / 2MWh
- Tibet Shuanghu: 4MW / 14MWh
- Tibet Guize: 4MW / 14MWh

Japan
- Hokkaido: 25MWh (3 Sites) Deployed 2015~
- Hokkaido Shinhidaka: 17MW / 9MWh
- Hokkaido Chitose: 17MW / 14MWh

Australia
- Alice Spring: 4MW / 2MWh
- Western Australia: 4MW / 2MWh

(As of Mar, 2019 Installation & Award)